REMARKS

Applicants acknowledge that Claims 16-21 have been withdrawn from consideration as being drawn to a non-elected species. Accordingly, Claims 16-21 have been cancelled, without prejudice, however, to Applicants' right to resubmit those claims in a divisional application, should it choose to do so.

Claims 12-16 and 22-23 have been rejected under 35 U.S.C. §112, second paragraph, for failing to particularly point out and distinctly claim the subject matter of the invention, based on a number of formal issues identified on page 2 of the Office Action. In response to these grounds of rejection, Applicants have amended Claim 12 in a manner which addresses and is believed to resolve each of the cited formal issues. Accordingly, reconsideration and withdrawal of these grounds of rejection are respectfully requested.

Claims 12-15 and 22-23 have been rejected under 35 U.S.C. §103(a) as unpatentable over Rinn et al (U.S. Patent No. 6,045,096) in view of either Jaenker (U.S. Patent No. 6,043,587) or Fard et al (U.S. Patent No. 6,025,975). However, for the reasons set forth hereinafter, Applicants respectfully submit that all claims which remain of record in this application, including new dependent Claims 24-28, distinguish over the cited references, whether considered separately or in combination.

The present invention is directed to a deformable aerodynamic profile member that has a front profile area and a rear profile area, with shells which bound the profile member on a pressure side and on a suction side thereof, which shells converge in a rear profile edge. As recited in Claim 12, d33 piezo actuators are provided for deforming the profiled member in a desired manner. In particular, the last paragraph of Claim 12 recites that the piezo actuators are arranged on the profile member with an orientation such that their length changes substantially in a direction that is within the planes of the shells, when the actuators are acted upon by electricity. Claims 23, 24 and 25 further specify, in varying terms, that each of the piezo actuators comprises a stack of alternating layers of piezo electric material and electrode layers formed of an electrically conducting material.

The Rinn et al patent, on the other hand, discloses a variable camber air foil, the structure and operation of which are best understood with reference to Figures 3 and 4. As noted in the Abstract of the Disclosure at lines 2-9, a flexible skin which substantially encloses the air foil profile is fixedly coupled to the trailing portion of the air foil and is slidable over the structure of the remainder of the air foil. (See also, Column 3, lines 42-45, and Column 4, lines 27-29.) As discussed in the specification at Column 3, lines 46-65, a pivot bar 38 (Figures 2 and 5), which is not numbered in Figures 3 and 4 can be manipulated by an operator via an actuator rod 34 to move the trailing edge 46 of the air foil

assembly downward, as can be seen from a comparison of Figures 3 and 4. (Column 3, lines 46-65; Column 4, lines 26-32.) Downward movement of the tail section 46 causes the skin to slide over the support structure 22 in a clockwise direction as indicated by the arrows in Figure 3 (Column 4, lines 26-28), causing the support arms 48 to rotate clockwise about fixed pivot points on the support structure. As a result, as can be seen by a careful comparison of Figures 3 and 4, the upper portion of the air foil assembly is pushed outward relative to the support section 22, while the lower portion is pulled toward the support structure 22. Thus, the air foil "bulges" on its upper surface, while its lower surface contracts. Such movements are, as noted, effected by the downward movement of the trailing edge 46 of the air foil via the pivot bar 38, so that the skin of the air foil slides in the clockwise direction, as noted previously. (See, for example, Column 4, lines 27-37.)

The Jaenker patent discloses a piezoelectric actuator which includes a solid state body 2 which is "made of a monolithic piezoelectric material" (Abstract) with a plurality of actuating electrodes which are formed (as closed loop electrodes) around the perimeter of the solid state body. In particular, as noted in the specification at Column 3, line 58 through Column 4, line 1, the closed loop actuating electrodes 4 extend "entirely around the perimeter of the piezoelectric solid state body 2, namely around the outer surfaces that bound the substantially rectangular cross-section of the solid state body 2." This

arrangement effectively forms "virtual zones or piezoelectric layers" 6 in the block of piezoelectric material such that, when a voltage is applied to the electrodes 4, the piezoelectric layer 6 undergoes a strain in the lengthwise direction L due to piezoelectric effect.

Finally, the Fard et al patent discloses apparatus for fine positioning of a reader head, mounted on an actuator arm 30, over a rotating disk 40 of a disk drive. For this purpose, a piezo element 27 is actuated by applying a voltage to "terminals" 29, 31 (Figure 2), which causes the gap in which the piezo element is mounted to widen, so that the actuator arm 30 moves slightly, in a manner which is illustrated (albeit exaggerated) by the dashed line in Figure 3. Alternative embodiments are illustrated in Figures 3 and 4, with the embodiment in Figure 4 orienting the piezoelectric element in such a manner that the expansion along the d33 axis is utilized.

As shown in Figures 2, 3, 4 and 5, and discussed in the specification at Column 3, lines 19-26 and Column 3, line 65 through Column 4, line 3, the piezoelectric element 27 (52 in Figure 4) is expanded or contracted by applying a voltage to terminals 29 and 31 (Figures 2 and 3), or 54 in Figure 6 (Figures 4 and 5). While the piezo element 10 itself is depicted in Figure 1 as consisting of a number of layers, the layers are not alternatingly stacked with electrodes.

A combination of the Rinn et al air foil structure with either of Jaenker or Fard et al would not replicate the present invention. Rather, as noted previously, in Rinn et al, the deformation of the air foil contour is achieved by rotation of the flexible skin 20 which covers the supporting structure 22 in a clockwise direction, which forces internal structural members (chiefly support arms 48) to move in a manner which deforms the surface. Linear expansion or contraction of the skin in Rinn et al therefore plays no role in a deformation mechanism. Accordingly, any attempt to incorporate the piezoelectric elements of either of Jaenker or Fard et al into the Rinn et al structure would be fruitless in view of the manner in which it operates. That is, if a person skilled in the art were to applied piezoelectric element to the skin 20 of the structure in Rinn et al, it would not contribute in any way to the operation of the structure which deforms the surface of the air foil. Thus, such a combination would be inoperative in the sense that there would be no functional cooperation between the piezoelectric element and the structure of Rinn et al which would serve to achieve the desired deformation. Applicants therefore respectfully submit that Claim 12 distinguishes over the combination of Rinn et al, and either Fard et al or Jaenker.

As noted previously, Claims 23-25 of the present application further specify that the piezo actuators comprises respective stacks of alternating layers of piezoelectric material and electrode layers formed of an electrically conducting

material. Claim 24 in particular recites that the piezo actuators comprise stack-form piezoelectric elements which are cut lengthwise, in a plane parallel to the expansion of the piezo element. Claim 23, on the other hand, further specifies that the piezo actuators are oriented relative to the profile member, with a stacking direction coinciding substantially with a desired expansion direction of the profile member.

The latter features of the invention are also not taught or suggested by either of Jaenker or Fard et al. As noted previously, in Fard et al, the piezo element 27 (54) consists of piezoelectric layers with electrodes situating only at the extremities. In Jaenker, on the other hand, the piezoelectric actuators "consist of a single integral or monolithic piece of a piezo ceramic material" and are surrounded about their perimeter by closed loop actuating electrodes 4. Specifically, the specification states that the close loop electrodes extend "around the outer surface that bound the substantially rectangular cross-section of the solid state body 2". (See Column 3, line 62 – Column 4, line 1.) Accordingly, Jaenker also fails to teach or suggest the provision of a piezoelectric element which is structured as a stack of alternating piezo layers and electrode layers, as recited in Claims 23-25. Accordingly, the latter claims distinguish over the cited references for this additional reason as well.

In light of the foregoing remarks, this application should be in consideration for allowance, and early passage of this case to issue is respectfully requested. If there are any questions regarding this amendment or the application in general, a telephone call to the undersigned would be appreciated since this should expedite the prosecution of the application for all concerned.

If necessary to effect a timely response, this paper should be considered as a petition for an Extension of Time sufficient to effect a timely response, and please charge any deficiency in fees or credit any overpayments to Deposit Account No. 05-1323 (Docket #056226.56477US).

Respectfully submitted,

Gary R. Edwards
Registration No. 31,824

CROWELL & MORING LLP
Intellectual Property Group
P.O. Box 14300
Washington, DC 20044-4300
Telephone No.: (202) 624-2500
Facsimile No.: (202) 628-8844
GRE:kms
7580596_1